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JOURNAL ARTICLE

Altered protamine 2 expression is uncommon in donors of known fertility, but common among men with poor fertilizing capacity, and may reflect other abnormalities of spermiogenesis

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During the spermatid elongation stage of spermiogenesis approximately 85% of sperm nuclear histones are replaced by protamines. Protamines increase the packing ratio of sperm chromatin, presumably facilitating sperm motility and function. In this study we evaluated the incidence of abnormal protamine expression in 75 patients undergoing in vitro fertilization (IVF) and 50 donors of known fertility by isolation of sperm nuclear proteins, quantitative gel electrophoresis, and Western blot analysis. In addition, we evaluated the relationship between abnormal protamine expression and semen quality, sperm penetration ability, chromatin stability, and IVF outcome. Seventeen percent (13/75) of IVF patients had no measurable protamine 2 (P2) versus 0% (0/50) of donors of known fertility ($P < .005$). Sperm penetration rates were decreased in 12 of 13 patients without P2, and mean penetration rates (4.6 ± 1.2 vs 32.8 ± 2.9 , $P < .005$), normal morphology (22.4 ± 3.6 vs 48.7 ± 4.2 , $P < .05$), and progressive motility (22.3 ± 2.5 vs 35.4 ± 2.1 , $P < .05$) were all significantly decreased compared with patients with measurable P2. The mean sperm concentration was not significantly different. The presence of protamine precursor bands was also associated with a diminished penetration capacity (18.4 ± 2.8 vs 36.7 ± 3.0 , $P < .05$). Sperm chromatin decondensation following exposure to heparin sulfate was significantly increased in patients without a measurable P2 band. Twelve patients with no measurable P2 underwent intracytoplasmic sperm injection (ICSI), with 6 patients (6/12, 50%) becoming pregnant. ICSI fertilization and subsequent embryo cleavage were not different in patients without P2 compared with other patients undergoing ICSI. These data indicate that abnormal sperm protamine levels are a common defect in infertility patients, but not in donors of known fertility. It appears that abnormal protamine levels may reflect defects of late spermiogenesis, including sperm penetration capacity.

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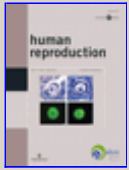
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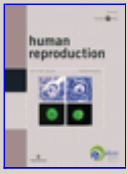
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